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A Comparative Study of Fentanyl With Midazolam Versus Dexmedetomidine for the Attenuation of Hemodynamic Response During Laryngoscopy and Intubation.

KEYWORDS: Pressor response, Dexmedetomidine, Fentanyl, Midazolam, Laryngoscopy, Intubation.

Dr. M. Sri Harsha
Senior Resident, Dept of Anesthesiology, GGH, Kakinada

Dr. Padma Vishal
Professor, Dept of Anesthesiology, ASRAMS

ABSTRACT *Endotracheal intubation and laryngoscopy are very essential tools in the hands of anaesthesiologists in maintaining airway. The circulatory response to laryngeal and tracheal stimulation following laryngoscopy and tracheal intubation is reflex sympathoadrenal stimulation. Although increase in heart rate and blood pressure due to sympathoadrenal response are short lived, they may have detrimental effects in high risk patients especially those with cardiovascular diseases, increased intracranial pressure or anomalies of cerebral vessels. Laryngoscopy and tracheal intubation induced pressor responses have been associated with increase in catecholamine levels. Norepinephrine, epinephrine levels rise. Rise of these catecholamines are associated with elevation of blood pressure and heart rate. Many strategies have been advocated to minimize the haemodynamic adverse*

responses and aimed at different levels of the reflex arc. Among the recommended procedures IV Lignocaine, Fentanyl, Esmolol, Midazolam and Dexmedetomidine appear to fulfill the above mentioned criteria. Intravenous lignocaine has shown variable results. Large doses of Fentanyl may cause unwanted side effects. Dexmedetomidine has been consistently associated with control of pressor response to laryngoscopy and intubation.

Introduction

Endotracheal intubation and laryngoscopy are very essential tools in the hands of anaesthesiologists in maintaining airway.

Endotracheal intubation has become an integral part of the anaesthetic management and critical care of the patient and has been practiced following its description by Rowbotham and Magill in 1921.

Reid and Bruce, 1940 and King Harris in 1951 described the circulatory response to laryngeal and tracheal stimulation following laryngoscopy and tracheal intubation as reflex sympathoadrenal stimulation.

Although increase in heart rate and blood pressure due to sympathoadrenal response are short lived, they may have detrimental effects in high risk patients especially those with cardiovascular diseases, increased intracranial pressure or anomalies of cerebral vessels.

Laryngoscopy and tracheal intubation induced pressor responses have been associated with increase in catecholamine levels. Norepinephrine, epinephrine levels rise. Rise of these catecholamines are associated with elevation of blood pressure and heart rate.

Some authors consider the intubation period one of the greatest risk in surgical patients with coronary artery diseases. Although the response may be transient, it is invariable, significant, often persistent, and of great concern.

The techniques of laryngoscopy and tracheal intubation are not confined only to the operating room, but are also employed for non anaesthetic purposes. Few instances are diagnostic laryngoscopy, fiberoptic bronchoscopy, intubation may be required for prevention of aspiration and protection of airway and mechanical ventilation. All these procedures can also produce sympathetic responses and one should keep in mind that many of these patients are at increased risk or critically ill.

Therefore it is important to find an effective means of attenuating sympathetic response to laryngoscopy and intubation. Many strategies have been advocated to minimize the haemodynamic adverse responses and aimed at different levels of the reflex arc.

Eg: Block of the peripheral sensory receptors and afferent input - topical application and infiltration of superior laryngeal nerve.

Block of the central mechanisms of integration of sensory input - fentanyl, morphine, droperidol, dexmedetomidine etc.

Block of the efferent pathway and effector sites - IV lignocaine, ß-blockers, calcium channel blockers, hydralazine etc.

No single drug or technique is satisfactory.

Recommendations for attenuation of reflex hypertension and tachycardia are therefore manifold. Besides minimizing the cardiovascular response, anaesthesia for

patients at risk must also satisfy the following requirements; it must be applicable regardless of patient collaboration, prevent impairment of cerebral blood flow and avoid arousal of the patient. It should neither be time consuming nor affect the duration or modality of the ensuing anaesthesia.

Among the recommended procedures IV lignocaine, fentanyl, esmolol, midazolam and dexmedetomidine appear to fulfill the above mentioned criteria. Intravenous lignocaine has shown variable results. Large doses of fentanyl may cause unwanted side effects. Dexmedetomidine has been consistently associated with control of pressor response to laryngoscopy and intubation.

The present study is undertaken to determine the efficacy

Volume : 6 | Issue : 3 | March 2016 | ISSN - 2249-555X | IF : 3.919 | IC Value : 74.50

of Fentanyl 1.5mcg/kg plus Midazolam 0.02mg/kg IV bolus and IV Dexmedetomidine 1µg/kg in attenuating the sympathetic responses to laryngoscopy and tracheal intubation.

To ascertain the effectiveness of fentanyl with midazolam and dexmedetomidine in suppressing sympathetic response.

Objectives:
This study of administration of fentanyl with midazolam and dexmedetomidine before laryngoscopy and tracheal intubation has following objectives.

1) To observe the variations in sympathetic response to laryngoscopy and intubation without measures to attenuate sympathetic response.

2) To study the effectiveness of -

a) Dexmedetomidine 1mcg/kg IV bolus administered for 10 minutes before laryngoscopy and intubation and

b) Fentanyl 1.5µg/kg IV with Midazolam 0.02mg/kg IV administered 5 minutes before laryngoscopy and intubation in attenuating the sympathetic response.

c) To ascertain the effectiveness of dexmedetomidine and fentanyl with midazolam in suppressing sympathetic response.

METHODOLOGY
A clinical comparative study of attenuation of sympathetic response to laryngoscopy and intubation was done in 60 patients posted for elective surgeries selected randomly. General anaesthesia was provided with endotracheal intubation for all the patients.

Study was conducted at Alluri sitarama raju academy of medical sciences, Eluru for a period of 18 months.

Patients were selected from ENT and general surgery departments posted for elective surgeries. Following criteria were adopted for selecting the patients.

Inclusion criteria:
- Patients scheduled for elective surgeries
- Age between 20 to 60 years of both the sexes.
- Patients with ASA grade I or II.
- Mallampati airway assessment of grade I & II.

Exclusion criteria:
Unwilling patients
- Emergency surgeries
- Anticipated difficult intubation
- Patients with ASA grade III or higher
- Patients with cardiovascular diseases
- Patients on beta blockers or calcium channel blockers or other $\alpha 2$ agonists.
- Patients in whom laryngoscopy and intubation proved to be prolonged or difficult.

Patients were selected after thorough preanaesthetic assessment and investigations.

An informed consent was taken from all the patients.
60 cases were divided into 2 groups.

Group A – Dexmedetomidine group. In this group 1mcg/kg of dexmedetomidine was given via IV infusion over 10 min before laryngoscopy and intubation.

Group B – Fentanyl + Midazolam group. In this group 1.5mcg/kg of fentanyl and 0.02mg/kg of midazolam were given 5 min before laryngoscopy and intubation.

Premedication :
All the patients were visited the day before surgery and preanaesthetic counselling was done. All patients received Alprazolam 0.5mg orally at night on the day before surgery.

On the day of surgery intravenous line was secured with 18G cannula and following premedications were given 15 minutes before induction.

Inj. Ondansetron 0.1mg/kg IV, Inj. Ranitidine 1mg/kg IV, Inj. Glycopyrrolate 0.05mg/kg IV

Patients were monitored by pulse oximetry, non invasive blood pressure and ECG monitors. A preinduction heart rate, systolic and diastolic blood pressures were recorded. IV infusion of RL solution was started.

Anaesthesia technique :
In group A dexmedetomidine infusion was started 10 minutes before induction. All the pateints were preoxygenated with 100% oxygen for 3 minutes before induction. Induction was achieved with Inj. Thiopentone sodium 5mg/kg IV given in 2.5% solution.

After induction of anaesthesia (loss of eyelash reflex), heart rate, systolic and diastolic blood pressures were recorded.

Succinylcholine was administered at a dose of 2mg/kg IV. Laryngoscopy was done using rigid laryngoscope with standard Macintosh blade. Intubation was done with appropriate sized, disposable, high volume low pressure cuffed endotracheal

tube. Oral intubation was done for all surgical procedures. Laryngoscopy and intubation was done within 15 to 20 seconds.

Heart rate, systolic, mean arterial and diastolic blood pressure were recorded at 10,5 and 1 minute intervals before induction, during induction, immediately after laryngoscopy and intubation and 1,3,6 and 9 minute intervals from the onset of intubation.

In group A, IV Dexmedetomidine infusion was given over 10 min before induction of anesthesia.

In group B, IV Fentanyl with midazolam were given 5 min before induction of anesthesia.

Statistical Analysis:
Descriptive data was presented as mean ± SD and in percentage. Group comparisons were made using unpaired 't' test for pair wise comparisons. For all the tests a 'P' value of ≤ 0.05 was considered for statistical significance.

Results:
10 Minutes before Induction:
SPO2 SPO2 recordings at 10 minutes before induction in both the groups was 100%. There was no significant difference in SPO2 in both the groups.

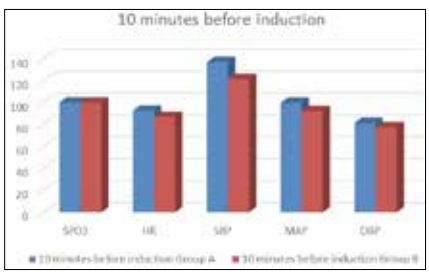
Heart Rate The mean Heart rate in group A was 92.63±12.58 and was 86.9±11.40 in group B. There was no significant change in mean heart rate in both the groups at 10 minutes before induction(P=0.068).

Volume : 6 | Issue : 3 | March 2016 | ISSN - 2249-555X | IF : 3.919 | IC Value : 74.50

Systolic BP The mean systolic BP in group A was 136.83±20.21SD and was 121.53±17.66SD in group B.There was significant variation in the mean systolic blood pressures in both the groups 10 minutes before induction(P=0.002).

Mean arterial pressure The mean Mean arterial pressure in group A was 99.9±14.29SD and was 92.3±13.85SD in group B. There was some significant change in the mean mean arterial pressures in both the groups 10 minutes before induction(P=0.041).

Diastolic BP The mean diastolic BP in group A was 81.5±13.02SD and was 77.66±13.04SD in group B. There was no significant change in diastolic blood pressures in both the groups 10 minutes before induction(P=0.25).



5 Minutes before induction:

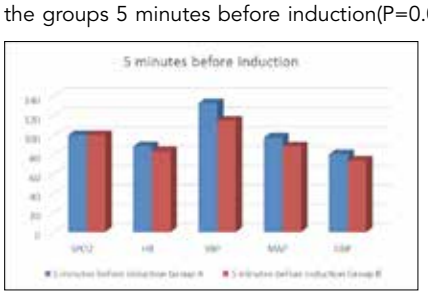
SPO2 The mean SPO2 in both the groups was 100. There was no significant difference in SPO2 at 5 min before induction in both the groups(P>0.05).

Heart rate The mean heart rate in group A was 88.5±11.43SD and was 83.5±12.76SD in group B. There was no significant difference in heart rates among both the groups 5 minutes before induction(P=0.11).

Systolic BP The mean systolic BP in group A is 132.76±18.37SD and was 114.86±14.59SD in group B. There was significant difference in mean systolic BP between group A and group B 5 minutes before induction(P=0.0001).

Mean arterial Pressure The mean mean arterial pressure was 97.56±12.99SD in group A and was 88.33±12.33 in group B. There was a significant difference in mean arterial pressures between both the groups 5 minutes before induction(P=0.006).

Diastolic BP The mean diastolic BP in group A was 80.33±14.23SD and was 73.9±11.76SD in group B. There was no significant difference in Diastolic BP among both the groups 5 minutes before induction(P=0.06).



1 Minute before induction:

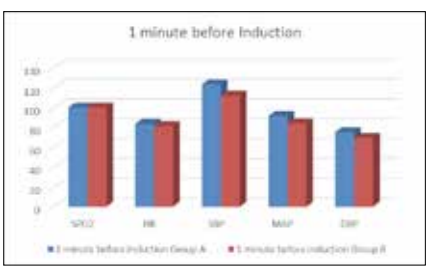
SPO2 The mean SPO2 among both the groups is 100 and there was no significant variance among both the groups at 1 minute before induction(P>0.05).

Heart Rate The mean heart rate in group A was 83.4±12.06SD and in group B was 81.2±13.43SD. There was no significant change in heart rate among group A and group B at 1 min before induction(P=0.5).

Systolic BP The mean systolic BP in group A was 123.13±17.52SD and in group B was 111.86±13.88SD. There was a significant difference in systolic BP among both the groups at 1 minute before induction(P=0.007).

Mean arterial pressure The mean Mean Arterial Pressure in group A was 91.43±12.54SD and in group B was 83.86±11.10SD. There was a significant difference in mean arterial pressure among both groups 1 minute before induction(P=0.01).

Diastolic BP The mean diastolic BP in group A was 75.03±12.57SD and in group B was 69.4±10.91SD. There was no significant difference in diastolic BP among both groups at 1 minute before induction(P=0.069).



At the time of Induction:

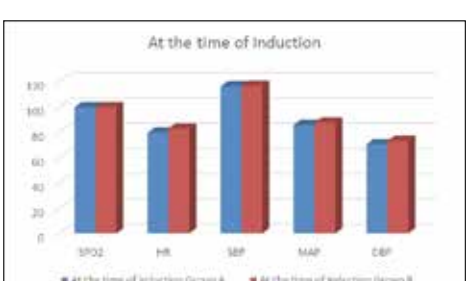
SPO2 The mean SPO2 in both the groups was 100 and there was no significant difference in SPO2 among both the groups at the time of induction(P>0.05).

Heart Rate The mean heart rate in group A was 79.73±11.82SD and in group B was 83.06±13.02SD. There was no significant change in heart rate among both the groups at the time of induction(P=0.30).

Systolic BP The mean systolic BP in group A was 116.53±17.87SD and in group B was 116.93±14.29SD. There was no significant change in systolic BP among both the groups at the time of induction(P=0.92).

Mean Arterial Pressure The mean arterial pressure in group A was 86±12.39SD and was 87.8±10.69SD in group B. There was no significant difference in mean arterial pressures among both the groups at the time of induction(P=0.54).

Diastolic BP The mean diastolic BP in group A was 70.7±12.10SD and was 73.3±10.25SD in group B. There was no significant change in diastolic BP among both the groups at the time of induction(P=0.3).



Immediately after Laryngoscopy and Intubation:

Volume : 6 | Issue : 3 | March 2016 | ISSN - 2249-555X | IF : 3.919 | IC Value : 74.50

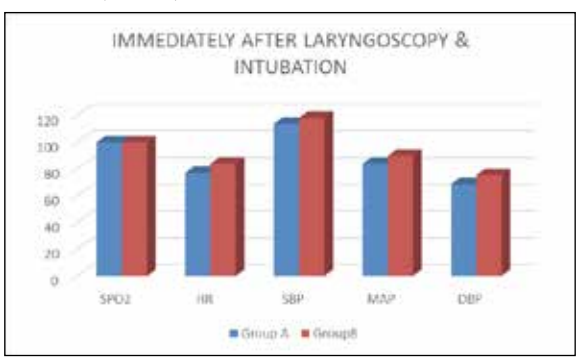
SPO2 The mean SPO2 among both the groups was 100. There was no significant difference in SPO2 among both the groups immediately after laryngoscopy and intubation(P>0.05).

Heart Rate The mean heart rate in Group A was 77.1±11.26SD and was 83.9±12.40SD in group B. There was a significant difference in heart rate among both the groups immediately after laryngoscopy and intubation(P=0.03).

Systolic BP The mean systolic BP in group A was 113.86±15.57SD and was 118.2±13.77SD in group B. There was no significant difference in systolic BP among both groups immediately after laryngoscopy and intubation(P=0.25).

Mean Arterial Pressure The mean Mean Arterial pressure in group A was 83.8±11.93SD and was 89.7±10.17SD in group B. There was a significant difference in mean arterial pressure among both the groups immediately after laryngoscopy and intubation(P=0.04).

Diastolic BP The mean diastolic BP in group A was 68.7±11.92SD and was 75.4±9.68SD in group B. There was a significant difference in diastolic BP among both the groups immediately after laryngoscopy and intubation(P=0.02).



1 Minute after intubation

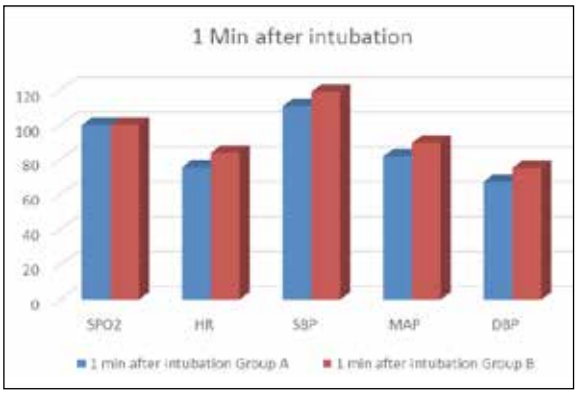
SPO2 The mean SPO2 in both the groups 1 minute after intubation was 100. There was no significant change in SPO2 in both the groups 1 minute after intubation(P>0.05).

Heart Rate The mean heart rate in group A was 75.93±11.50SD and in group B was 84.2±12.55SD. There was a significant difference in heart rate among both the groups 1 minute after intubation(P=0.01).

Systolic BP The mean systolic BP in group A was 110.96±16.20SD and in group B was 119.2±14.22SD. There was a significant difference in systolic BP among both the groups 1 minute after intubation(P=0.04).

Mean Arterial Pressure The mean Mean Arterial Pressure in group A was 82.06±12.74SD and in group B was 89.9±10.02SD. There was a significant difference in Mean arterial pressures among both the groups 1 minute after intubation(P=0.01).

Diastolic BP The mean diastolic BP in group A was 67.63±12.53SD and in group B was 75.53±9.83SD. There was a significant difference in diastolic BP among both the groups 1 minute after intubation(P=0.008).



6 Minutes after intubation

SPO2 The mean SPO2 in both the groups was 100. There was no significant difference in SPO2 among both groups 6 minutes after intubation(P>0.05).

Heart Rate The mean heart rate in group A was 69.53±9.37SD and was 81.6±11.87SD.

There was a significant difference in heart rate among both the groups 6 minutes after intubation(P<0.001).

Systolic BP The mean systolic BP in group A was 102.16±12.02SD and was 113.26±10.83SD in group B. There was a significant difference in systolic BP among both the groups 6 minutes after intubation(P=0.0004).

Mean Arterial Pressure The mean Mean Arterial Pressure in group A was 75.93±10.73SD and was 84.56±8.24SD in group B. There was a significant difference in mean arterial pressure among both the groups 6 minutes after intubation(P=0.0009).

Diastolic BP The mean diastolic BP in group A was 62.53±10.55SD and was 70.2±8.65SD in group B. There was a significant difference in diastolic BP among both the groups 6 minutes after intubation(P=0.003).